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Atmospheric Measurement Techniques Discussions

Interactive comment on "New Aura Microwave Limb Sounder observations of BrO and implications for Br_y" *by* L. Millán et al.

Anonymous Referee #1

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This short paper introduces a new off-line algorithm for the retrieval of stratospheric BrO vertical profiles from the Aura Microwave Limb Sounder (MLS). First, the retrieval methodology and an error analysis are described. Then the consistency of the retrieved BrO profiles with two chemical transport models (SLIMCAT and WACCM) and observational data from the ENVISAT/SCIAMACHY and ODIN/OSIRIS satellite instruments is investigated. Finally, a mean stratospheric Bry loading is derived using the MLS BrO observations and model calculations. This Bry estimate is consistent with previously published values.

Although well written and clearly structured, this paper suffers from major weaknesses (see below) which makes the discussion of the results very qualitative. It is therefore difficult for the reader to make an opinion about the quality and robustness of the new

MLS BrO data set. This calls for major revisions before the paper can be accepted for publication in AMT.

Major comments:

1/Zero order comparisons with SCIAMACHY and OSIRIS observations are used to assess the quality of the new MLS BrO dataset. As it is done, these comparisons are not relevant since the three datasets correspond to different local times. Given the strong diurnal variation of BrO in the stratosphere, it is a bit like comparing apples with oranges and therefore no conclusion can be drawn on the agreement between MLS and the two other satellite instruments. To investigate the quality of the MLS BrO dataset, the authors have to perform comparisons in the same photochemical conditions using a box model, as suggested on Page 334, lines 17-19. Such a quantitative validation exercise should appear in the revised version of the manuscript, otherwise the paper will not contain any relevant information about the quality of the new MLS BrO data.

2/A VSLS contribution to Bry of 5+/-4.5 ppt is derived from MLS observations and model simulations. An uncertainty of 4.5 ppt is optimistic since it does not include the errors on the estimates of CH3Br and long-lived halons and the errors induced by the model calculations. Previous studies (Sioris et al., 2006; Hendrick et al., 2008) showed that the uncertainties on rates of some key bromine reactions (BrO+NO2+M -> BrONO2, BrONO2 photolysis) can lead to an error of 10-20% on the inferred Bry. In the revised version of the manuscript, these errors have to be taken into account in the error budget of VSLS.

Minor comments:

Page 329, lines 15-16: the authors should explain the advantage(s) of using averaged temperature, O3, and HNO3 data from the standard algorithm in their retrieval.

Page 330, lines 13-17: In Sect. 3.1, the different parameters related to the vertical resolution and information content of the MLS BrO measurements are described the-

oretically. The authors should also discuss the values of these parameters derived from Fig. 3. How do they compare with corresponding values from SCIAMACHY and OSIRIS ? Please discuss this point in the paper.

References:

Hendrick, F., et al., One-decade trend analysis of stratospheric BrO over Harestua (60°N) and Lauder (45°S) reveals a decline, GEOPHYSICAL RESEARCH LETTERS, VOL. 35, L14801, 5 PP., 2008, doi:10.1029/2008GL034154

Sioris, C. E., et al., Latitudinal and vertical distribution of bromine monoxide in the lower stratosphere from Scanning Imaging Absorption Spectrometer for Atmospheric Chartography limb scattering measurements, JOURNAL OF GEOPHYSICAL RESEARCH, VOL. 111, D14301, 25 PP., 2006, doi:10.1029/2005JD006479

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 325, 2012.